

**NORTH DAKOTA DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH SECTION**

**MONITORED AIR QUALITY
IN NORTH DAKOTA**

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Monitored Air Quality in North Dakota And Theodore Roosevelt National Park In Relation to Several Relevant National Ambient Air Quality Standards (NAAQS)

The Clean Air Act requires the EPA to set standards for pollutants that cause adverse effects to public health or the environment.¹ The Clean Air Act establishes two types of standards – “primary” and “secondary.” “Primary” standards protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. The primary standards are often referred to as the “health” standards. “Secondary” standards protect public welfare and the environment, including protection against damage to animals, crops, vegetation, buildings and other non-human “receptors.” EPA reviews the standards periodically to ensure that they include the most recent scientific information. The Clean Air Act requires the EPA to do an extensive review of scientific, health, and technical data and research to determine the levels below which each pollutant is unlikely to have any health or welfare impacts on the most sensitive populations and receptors.²

North Dakota is one of only 11 states currently in compliance with all of the national ambient air quality standards (NAAQS),³ and is one of only six states that have never had a violation of any of the NAAQS since the Clean Air Act was enacted in 1970.⁴ But compliance with the NAAQS is only part of the story. North Dakota’s air quality is, in fact, usually considerably better than the NAAQS.

ND’s System of Air Quality Monitors

The North Dakota Department of Health, in cooperation with EPA and the National Parks Service, has established a real-time, online air monitoring system and web camera at Painted Canyon in the south unit of Theodore Roosevelt National Park (TRNP).⁵ In addition, the North Dakota Department of Health operates a network of ambient air quality monitors at many other locations.⁶ The web cam at Painted Canyon in TRNP is one of many web cams and real time monitoring reporting systems installed by EPA and the National Parks Service, in cooperation with other states and other entities, in national parks (as well as several metropolitan areas) to monitor visibility,⁷ as well as ground-level ozone.⁸ The TRNP Painted Canyon website, however, is the only national park website that reports pollutant concentrations for three pollutants – ground-level ozone, fine particulate matter (PM-2.5), and SO₂; most national park

¹ Clean Air Act § 109, 42 U.S.C. § 7409.

² Clean Air Act § 109(d), 42 U.S.C. § 7409(d).

³ EPA website, EPA Green Book, at <http://www.epa.gov/oar/oaqps/greenbk/multipol.html>.

⁴ EPA website, EPA Green Book, at <http://www.epa.gov/oar/oaqps/greenbk/anay.html>.

⁵ See web cam and monitoring data at <http://www2.nature.nps.gov/air/webcams/parks/throcaml/throcaml.htm>.

⁶ See ND Department of Health website at <http://www.health.state.nd.us/AQ/AmbientMonitoring.htm>.

⁷ See EPA website at <http://www.epa.gov/airnow/webcam.html>.

⁸ See EPA website at <http://www.epa.gov/airnow/>.

sites are reporting only ozone concentrations.⁹ What do the North Dakota Department of Health's network of ambient air quality monitors show about North Dakota's air quality in TRNP and other locations in the state?

Ozone

For ground-level ozone, not only has North Dakota always been in compliance with the new 8-hour and old 1-hour ozone NAAQS standards,¹⁰ but also Billings County, Cass County, Dunn County, Oliver County, and Mercer County in North Dakota are among the cleanest counties in the United States for ground-level ozone.¹¹ In addition, the Fargo-Wahpeton metropolitan area is among the 22 cleanest metropolitan areas of the United States for ground-level ozone air pollution.¹² Billings County, North Dakota is where the south unit of TRNP is located.

Particulate Matter

For particulate matter, not only has North Dakota always been in compliance with the NAAQS for fine particulate matter (PM-2.5) and particulate matter (PM-10),¹³ but also the Counties of Billings, Burke, Burleigh, Cass, and Mercer in North Dakota are among the cleanest counties in the United States for short-term fine particle pollution (24-hour PM-2.5).¹⁴ Again, Billings County is where the south unit of TRNP is located. In addition, Burke County ranks 8th, Mercer County Ranks 10th, and Burleigh County ranks 25th, of all the counties in the United States for the cleanest air in the nation for annual mean fine particulate concentrations (Annual PM-2.5).¹⁵ Bismarck ranks 8th and the Fargo-Wahpeton metropolitan area ranks 16th among all U.S. cities for the cleanest air in the nation for annual mean fine particulate concentrations (Annual PM-2.5).¹⁶ In 2005, Billings County was ranked as the second cleanest county in the United States for annual mean fine particulate concentrations (Annual PM-2.5).¹⁷ In other words, Billings County, where the TRNP South Unit is located, had the second cleanest air for

⁹ Compare real time monitoring data published on different national park webcam sites at <http://www2.nature.nps.gov/air/webcams/parks/throcaml/throcaml.htm>. This comparison was made on July 5, 2004.

¹⁰ See EPA website, <http://www.epa.gov/air/criteria.html>, for ozone NAAQS.

¹¹ American Lung Association, "State of the Air: 2004," Table 6b: "Cleanest Counties for Ozone Air Pollution," at http://lungaction.org/reports/sota04_table6b.html. These are most of the counties where monitors have been placed by the ND Department of Health. Other ND counties would likely be included if monitors were placed in them. Mercer and Oliver counties were chosen for monitors because they are counties where one or more coal-fired power plants are located.

¹² American Lung Association, "State of the Air: 2004," Table 5b: "Cleanest U.S. Cities for Ozone Air Pollution," at http://lungaction.org/reports/sota04_table5b.html.

¹³ See EPA website, <http://www.epa.gov/air/criteria.html>, for particulate matter NAAQS.

¹⁴ American Lung Association, "State of the Air: 2004," Table 6: "Cleanest Counties for Short-term Particle Pollution (24-Hour PM-2.5)," at http://lungaction.org/reports/sota04_table6.html.

¹⁵ American Lung Association, "State of the Air: 2004," Table 6a: "Top 25 Cleanest Counties for Long-term Particle Pollution (Annual PM-2.5)," at http://lungaction.org/reports/sota04_table6a.html.

¹⁶ American Lung Association, "State of the Air: 2004," Table 5a: "Top 25 Cleanest U.S. Cities for Long-term Particle Pollution (Annual PM-2.5)," at http://lungaction.org/reports/sota04_table5a.html.

¹⁷ American Lung Association, "State of the Air: 2005," Table 6a: "Top 25 Cleanest Counties for Long-term Particle Pollution (Annual PM2.5)," http://lungaction.org/reports/sota05_table6a.html.

fine particulate in the United States for annual mean fine particulate concentrations for the period covered by the 2005 report.

SO2 NAAQS Standards

No similar rankings are available for counties and cities for sulfur dioxide (SO₂) concentrations, so a comparison of SO₂ concentrations in TRNP with the SO₂ NAAQS that protect health and welfare will make clear how low the concentrations of SO₂ are in TRNP in relation to the 3-hour-, 24-hour, and annual NAAQS standards for SO₂.

SO2 Secondary NAAQS Standard

The “secondary” or “welfare” standard for SO₂ is the 3-hour standard.¹⁸ As noted above, secondary standards are established by EPA under the Act to protect public welfare, including protection against damage to animals, crops, vegetation, and buildings.¹⁹ The secondary standard for SO₂ is .5 parts per million for each 3-hour averaging period, which can be converted mathematically to either 500 parts per billion or 1300 micrograms per cubic meter of ambient air.²⁰

The Department of Health compiled a frequency diagram of all monitored 3-hour concentrations of SO₂ taken in TRNP since 1980 when it prepared for the SO₂ periodic review hearing held by the Department. The Department found that for the south unit of TRNP the monitored 3-hour level of SO₂ was greater than 5 parts per billion less than one percent of the time between 1980 and 1998.²¹ 5 parts per billion is one percent of the 3-hour secondary standard for SO₂ of 500 parts per billion – the level that is established to protect animals, plants, and buildings.

In other words, measured SO₂ concentrations in the south unit of TRNP exceeded one percent of the secondary standard for SO₂ – the level established to protect public welfare – less than one percent of the time.

For the north unit of TRNP, between 1984 and 1998 (after the practice of flaring natural gas from oil and gas wells near the north unit was largely curtailed), the monitored 3-hour levels of SO₂ exceeded 5 parts per billion, or one percent of the secondary standard, only about 2 percent of the time.²²

This study also found that from April through October (the second and third quarters of the year when plants grow, mature, and die or become dormant because of frost in North Dakota), *there was not a single instance* between 1980 and 1998 when the monitored readings of SO₂ in the south unit of TRNP exceeded 10 parts per billion, or two percent of the SO₂ secondary standard of 500 parts per billion.²³ In other words, the monitored readings of SO₂ in the south unit of TRNP was less than two percent of the SO₂ secondary standard that protects plants and animals at all times during the growing season between April 1st and November 1st of each year from 1980 through 1998.

¹⁸ See EPA website, <http://www.epa.gov/air/criteria.html>, for SO₂ NAAQS.

¹⁹ Clean Air Act § 109(b)(2), 42 U.S.C. § 7409(b)(2).

²⁰ See citation in webpage at footnote 23.

²¹ “A Review of the Historical Application of Prevention of Significant Deterioration in North Dakota,” North Dakota SO₂ PSD Periodic Review Hearing Exhibit 11, Figure 6, and pages 22-23, Hearing Record (HR) pages 705-06. Specifically, the percentage was .78 of one percent. *Id.* at document page 23, HR page 706.

²² *Id.* at Figure 6, document page 22, HR page 705.

²³ *Id.* at document page 23, HR page 706.

For the north unit of TRNP, where the monitored levels of SO₂ historically have been slightly higher than the south unit, this study determined that for all years after 1986 more than 90 percent of all monitored readings of 3-hour SO₂ concentrations were less than 2 parts per billion – the lowest concentration that the monitors were capable of measuring for most of the period between 1980 and 1998.²⁴ In other words, after 1986 the monitors in the north unit of TRNP have detected no SO₂ in the air over the north unit more than 90 percent of the time.²⁵

SO₂ Primary NAAQS Standards

There are two primary SO₂ NAAQS – a 24-hour block averaged SO₂ concentration limit of .14 parts per million (which translates into 140 parts per billion, or 365 micrograms per cubic meter of ambient air);²⁶ and an annual average or mean SO₂ concentration limit of .03 parts per million (which translates into 30 parts per billion, or 80 micrograms per cubic meter of ambient air).²⁷ As noted above, the purpose of the primary NAAQS is to protect “public health” with a margin of safety, including protection of sensitive populations.²⁸

All the discussion above about the monitored levels of SO₂ in the north and south units of TRNP in relation to the SO₂ secondary NAAQS standard also applies to the two SO₂ primary NAAQS standards. Two additional points about monitored levels of SO₂ in TRNP are emphasized here with regard to the 24-hour and annual SO₂ primary NAAQS standards.

First, for the 2000-2002 time period that North Dakota is currently examining to determine compliance with the prevention of significant deterioration (PSD) SO₂ Class I increments,²⁹ the second highest³⁰ monitored 24-hour SO₂ concentrations in TRNP for each year were:

- 2000 – 9.69 micrograms per cubic meter of ambient air;³¹
- 2001 – 8.81 micrograms per cubic meter of ambient air;
- 2002 – 8.30 micrograms per cubic meter of ambient air.³²

To put these concentrations into the perspective of the primary SO₂ NAAQS standards, each of these second high 24-hour concentrations for each year from 2000-2002 is less than 3 percent of the 24-hour SO₂ NAAQS standard of 365 micrograms per cubic meter of ambient air

²⁴ Id. at Figure 7 and document page 23, HR page 706.

²⁵ That does not mean that there wasn't any SO₂ in the air over the north unit – only that any SO₂ in the air was less than the monitor's detectable concentration limit of 2 parts per billion.

²⁶ See EPA website, <http://www.epa.gov/air/criteria.html>, for SO₂ NAAQS.

²⁷ Id.

²⁸ Clean Air Act § 109(b)(1), 42 U.S.C. § 7409(b)(1).

²⁹ Another program under the Clean Air Act.

³⁰ The high, 2nd high concentration is the one by which compliance is measured for SO₂ 3-hour and 24-hour block averaged concentrations under the Clean Air Act. In other words, the standard may be exceeded once each year.

³¹ Since the PSD increments and alternative increments were enacted by Congress in micrograms per cubic meter (ug/m³), rather than in parts per million (ppm) or billion (ppb), PSD compliance is usually stated in micrograms per cubic meter rather than parts per million or billion. See CAA §§ 163(b) & 165(d)(1)(C)(iv), 42 U.S.C. §§ 7473(b) & 7475(d)(1)(C)(iv). 1 part per billion can be translated into micrograms per cubic meter by multiplying by 2.62, i.e., one part per billion (ppb) equals 2.62 micrograms per cubic meter (1 ppb = 2.62 ug/m³).

³² See “A proposed alternative air quality modeling protocol to examine the status of attainment of PSD Class I Increment April 30, 2004,” page 6, at North Dakota Department of Health website at <http://www.health.state.nd.us/AQ/Notices.htm>.

(or 140 ppb). And when translated into parts per billion all of these second high readings for each year are less than 4 ppb (again, the annual average standard is 30 ppb, the 24-hour standard is 140 ppb, and the 3-hour standard is 500 ppb).³³

Second, the Department's compilation and review of the monitoring data for 3-hour SO₂ concentrations in the north unit of TRNP for each year from 1987 through 1998 (the unit of the park where SO₂ concentrations have historically been higher) revealed that the 2nd high monitored 3-hour SO₂ concentration for each year from 1987 to 1998 was less than 25 parts per billion (ppb).³⁴ There are 2,920 3-hour block averaged concentrations in each calendar year of 365 days.³⁵ The annual average SO₂ primary NAAQS standard is 30 parts per billion (30 ppb), or 80 micrograms per cubic meter of ambient air (80 ug/m³). This means that not a single 2nd high 3-hour SO₂ concentration taken for the TRNP north unit from 1987 to 1998³⁶ (of the 2,920 3-hour block averaged concentrations of SO₂ taken each year during that 12 year period) exceeded the primary NAAQS SO₂ *annual average* standard of 30 ppb, let alone the primary NAAQS 24-hour standard of 140 ppb, or the relevant secondary NAAQS 3-hour standard of 500 ppb.

Smog

SO₂ is not a pollutant that contributes to either smog or ground-level ozone pollution, and, for the reasons summarized below, North Dakota has not had any "smog" issues.

Smog is a brownish haze in the air that occurs most commonly over large, high-density population areas in the summertime. The primary component of smog is ozone, a gas that is created when nitrogen oxides react with volatile organic compounds in the atmosphere. Nitrogen oxide (NO_x) is produced when people burn things such as gasoline, coal, and natural gas.³⁷ Primary ways that people release volatile organic compounds (VOCs) into the air include motor vehicle exhaust, industrial emissions, gasoline vapors, and chemical solvents.³⁸ Because bright sunlight and warmer weather trigger the chemical reactions between NO_x and VOCs that form ozone, the highest concentrations of ground-level ozone³⁹ occur primarily in the summertime in large metropolitan areas when high concentrations of NO_x and VOCs become trapped near the surface on clear, hot days.

North Dakota does not have the large population areas, the motor vehicle emissions, or the geographical or weather conditions that cause dangerous levels of ground-level ozone to

³³ See footnote 30 for the equation to convert ppb into ug/m³.

³⁴ "A Review of the Historical Application of Prevention of Significant Deterioration in North Dakota," footnote 20 above, document page 23, HR page 706.

³⁵ *Id.* at document page 22, HR page 705.

³⁶ The second highest 3-hour monitored concentration is the 2nd highest of 2,920 3-hour SO₂ concentrations for each 365 day year.

³⁷ "Smog / Regional Transport of Ozone," EPA website at <http://www.epa.gov/airmarkets/regozone/index.html>; see also American Lung Association website, "Ozone Air Pollution Fact Sheet," at <http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=35354>.

³⁸ See "Ground-level Ozone: What is it? Where does it come from?" EPA's website at <http://www.epa.gov/air/urbanair/ozone/what.html>. Regional sources of NO_x and VOCs are listed on the American Lung Association Website at http://lungaction.org/reports/sota04_region8.html.

³⁹ Ozone in the upper atmosphere is critical to life on earth because it blocks harmful ultra violet rays, but at ground level it is a very reactive chemical compound that is harmful to human health.

form on hot sunny days.⁴⁰ Although North Dakota power plants emit NOx, the emissions do not violate any NAAQS relating to NOx or ground-level ozone. Thus, neither smog nor ozone has ever been an environmental issue of significant concern in North Dakota.

Summary of TRNP Air Quality

In sum, when compared to the primary and secondary NAAQS standards established by EPA for SO2 and other pollutants to protect public health and welfare, the measured concentrations recorded in TRNP since 1980 are very low, and TRNP's air is very clean. In fact, when compared to other areas, TRNP's air is among the cleanest in the United States. One of the air quality scientists who testified at North Dakota's recent periodic review hearing to determine TRNP's air quality in relation to the PSD Class I increments stated that the air quality in TRNP is "about as good as it gets"⁴¹ – "I mean, you could take that monitor, those monitors, and move them out to anyplace else that I can think of in the United States and you wouldn't get any lower concentrations ... Maybe if you put it up on the North Slope of Alaska you might be able to do better."⁴²

⁴⁰ As discussed above under "Ozone," North Dakota's concentrations of these pollutants are among the lowest in the nation.

⁴¹ Testimony of Kirk Winges, ND PSD Periodic Review Hearing, May 7, 2002 transcript, page 371.

⁴² Id. at page 369.